

CALYPTRAEOTHERES, A NEW GENUS OF
PINNOTHERIDAE FOR THE LIMPET CRAB
FABIA GRANTI GLASSELL, 1933
(CRUSTACEA, BRACHYURA)

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Abstract.—*Fabia granti* Glassell, 1933 is incorrectly assigned to the genus *Fabia* Dana, 1851. Its unique morphological features include: (1) lack of two longitudinal sulci on the carapace; (2) the anterolateral margins of the carapace are sharp-edged; (3) the third maxilliped has a palp of two articles, carpus longer and wider than propodus, and (4) abdomen, in both sexes, of seven free somites, and these support the placement of *F. granti* as type species of a new pinnotherid crab genus, *Calyptraeotheres*. In addition to the morphological differences, this genus is ecologically different from others in the Pinnotheridae, since it is a symbiont of gastropods, family Calyptraeidae.

Resúmen.—*Fabia granti* Glassell, 1933 ha estado incorrectamente asignada dentro del género *Fabia* Dana, 1851. Sus características exclusivas incluyen: (1) ausencia de dos surcos longitudinales sobre el caparazón; (2) márgenes del caparazón agudos; (3) tercer maxilipedio con su palpo formado de dos artejos, el carpus más ancho y largo que el propodus y (4) el abdomen, en el macho y la hembra, formado de siete somitos libremente articulados. Lo anterior apoya la asignación de *F. granti* como especie tipo de un nuevo género de cangrejo en la familia Pinnotheridae, *Calyptraeotheres*. Adicional a las características morfológicas, *Calyptraeotheres* es ecológicamente diferente de otros géneros en los Pinnotheridae dado que es simbiote de Mollusca—Gastropoda, familia Calyptraeidae.

The pinnotherid crab genus *Fabia* was established by Dana, 1851 with *F. subquadrata* Dana, 1851, from the northeastern Pacific, as its type species. Subsequently, eleven species were assigned within this genus (Schmitt et al. 1973, Rodrigues da Costa 1970, De Melo 1971, Cobb 1973, Dai 1980, Gore 1986). Of these, two species have been transferred to other genera. Pregonzer (1979) assigned *F. hickmani* to *Pinnotheres* Bosc, 1802, and Campos (1989a) included *F. unquifalcula* in *Orthootheres* Sakai, 1965. Recent examination of males and females of *F. granti* Glassell, 1933, and their comparison with specimens and descriptions of *F. subquadrata* (Rathbun 1918, Davidson

1968) revealed several morphological differences of taxonomic importance. In *F. subquadrata* two longitudinal sulci, which arise from the upper margin of the orbit, are present on the carapace of the female, the palp of the third maxilliped is composed of three articles in both sexes and the abdomen of the male has somites 3–5 fused (Rathbun 1918, pers. obs.). In contrast, *F. granti* does not show the sulci, the palp is composed of two articles in both sexes, and the abdomen of the male is formed by seven free somites. These morphological differences suggest that (1) *F. granti* should not be considered as congeneric with *F. subquadrata*; (2) its inclusion within genus

Fabia was incorrect; and (3) as *F. granti* is morphologically unique in the Pinnotheridae, a new genus should be proposed to receive this singular species.

Systematic Results

Family Pinnotheridae

Calyptraeotheres, new genus

Diagnosis.—Female: Carapace with anterolateral margin arcuate and sharp-edged, dorsal regions ill-defined. Third maxilliped obliquely placed in buccal cavity; ischium and merus indistinguishably fused, widening distally, inner margin concave, distal one almost straight; palp with two articles, carpus wider and longer than propodus, latter digitiform and obliquely truncated. Abdomen with seven free somites, covering sternum but not reaching to buccal area.

Male: Carapace subpentagonal, regions ill-defined, dorsal surface even and with short and separate setae; anterolateral margins with fringe of hair-like setae. Third maxilliped similar to that of female. Abdomen with seven free somites, widest at third somite and narrowing toward seventh.

Type species.—By present designation, *Fabia granti* Glassell 1933. The genus is monotypic.

Etymology.—*Calyptraeotheres* has been selected to emphasize the symbiotic relationship between the limpet-crabs and gastropods, family Calyptraeidae. Gender masculine.

Distribution.—East Pacific: Golfo de California and West coast of Baja California Sur at Bahía Magdalena (Glassell 1933, 1935).

Hosts.—Mollusca: Gastropoda: Calyptraeidae: *Crepidula* and *Crucibulum*. Acmaeidae: *Acmaea*.

Remarks.—At present five genera in the Pinnotheridae contain one or more species with the palp of the third maxilliped composed of two articles. These are, *Dissodactylus* (sensu Griffith 1987), *Durckheimia* (sensu Serène 1967), *Ostracotheres* (sensu

Tesch 1918, Pregonzer 1988), *Pinnotheres* (sensu Roberts 1975), and *Xanthasia* (sensu Bürger 1895). The genus *Calyptraeotheres* can be distinguished from all of these genera because its carapace is smooth, with the regions ill-defined and the anterolateral margins sharp-edged, and the carpus of the third maxilliped being larger than the digitiform and obliquely truncated propodus. Furthermore, *Calyptraeotheres* is also different ecologically. This genus is an ecosymbiont of limpets, Gastropoda—Calyptraeidae, while the genera listed above are symbionts of echinoids, Bivalvia, and/or Tunicata, which suggest divergent evolutionary trends. Only one species is now included within *Calyptraeotheres*; however, two additional ones, *Pinnotheres politus* (Smith, 1870) and *P. garthi* Fennuci, 1975, possibly should be included in this new genus. The comparison between *C. granti* and descriptions and figures of *P. politus* and *P. garthi* recorded by Rathbun (1918), Garth (1957) and Fennuci (1975) suggest that both males and females of *C. granti* share a morphological similarity to the South American species which are symbionts of limpets, family Calyptraeidae, too. The major difference observed in *P. politus* and *P. garthi* is the presence of a minute and rounded dactylus on the palp of the third maxilliped (Fig. 2B, C). A decision on the status of these Austral species and whether they should be included in *Calyptraeotheres* awaits a revision of the type series or of voucher specimens.

Calyptraeotheres granti (Glassell, 1933),
new combination
Figs. 1, 2A, D–F

Fabia granti Glassell, 1933:342, pl. 26, fig. 1–3; 1934:301; 1935:105; 1938:452, pl. 33, fig. 12.—Balss, 1957:1421.—De Melo, 1971:202.—Schmitt, McCain & Davidson, 1973:24.—Campos-González & Macías-Chávez, 1988:241.—Campos, 1989a: 1127.

Material examined.—Eighty-four males,

carapace width from 1.7 to 3.1 mm and 296 females (196 ovigerous), carapace width from 2.2 to 8.8 mm, collected between August 1983 to July 1984, Laguna Percebú, about 23 km south of San Felipe, Baja California, Mexico, (lat 30°49'00"N, long 114°41'40"W), E. Campos coll.

Distribution.—Golfo de California, and West coast of Baja California Sur at Bahía Magdalena (type locality), (Glassell 1933, 1935).

Female.—Carapace (Fig. 1A) with front little projected, anterior third arcuate, lateral margins subparallel and posteriorly convergent; posterior margin straight or little concave in middle. Carapace margins, specially of frontal and anterolateral regions, sharp-edged. Gastric, cardiac and intestinal regions ill-defined, limited by straight cervical depressions arising from orbital region. Antennular grooves large. Orbits small, completely filling sockets, cornea not visible in dorsal view. Buccal cavity crescentic. Third maxilliped placed obliquely, ischium and merus indistinguishably fused, widening distally, inner margin concave, distal margin straight; palp placed in outer angle of merus, with two articles, carpus longer and wider than propodus, latter obliquely truncated (Fig. 2A). Chelipeds stout, palm widening distally, outer and inner surfaces even; dactylus with proximal, small, blunt tooth, occasionally other smaller tooth present; propodus with two proximal blunt teeth separated by notch where tooth of dactylus fits. Fingers little deflexed, without gap when closed; ventral margin of palm almost straight, with fringe of hair arising from distal third reaching to end of pollex; both fingers curved inward to tip.

In decreasing order, relative length of walking legs $3 > 2 > 4 > 1$. Third slightly longer than second, latter a little longer than fourth. Legs 1 to 3 of similar shape, their height increasing towards third leg, fourth being the most slender. First three pairs of

walking legs with margins of propodi converging distally, those of fourth pair subparallel; relative length of above-mentioned propodi similar to those of walking legs. Dactyli acute and curved at tip, in decreasing order the relative length is $4 > 3 > 2 > 1$.

Abdomen with seven free somites, covering the sternum and not reaching to buccal cavity, fourth somite widest, fifth longest.

Male.—Carapace subpentagonal (Fig. 1B), as long as wide, occasionally a little wider than long, regions ill-defined, dorsal surface even, with short, separate setae. With exception of posterior margin in small specimens, carapace margins with closely-set short hair-like setae. Frontal area from widely arcuate to subrectangular, with medial sulcus covered with setae. Cervical depressions similar to the female, but shallower. Eyes dorsally visible. Antennular grooves filling ventral surface of frontal region. Antenna small but visible.

Third maxilliped covered with feathery setae; similar to that of female except for relatively wider merus (Fig. 2D).

Chelipeds stout, longer than first leg, merus and carpus evenly, with hair; chela as long as, or longer than, the preceding articles together; palm widening suddenly in proximal third, dorsal margin almost convex, ventral one rather straight, both with fringe of hair-like setae; palm surfaces covered with scattered hair, inner surface inflated; dactylus curved, with dorsal fringe of hair and proximal, acute and triangular tooth on cutting edge; pollex without hair but with small blunt teeth along cutting surface. Fingers curved inwardly to tip.

Walking legs similar in shape, surface with small and scattered hair-like setae; dorsal and ventral margins of meri, propodi and dactyli with fringe of short and very close setae; legs 2 and 3 with an additional fringe of natatory setae. Propodus spatulate, dactylus curved, more slender than preceding articles. In decreasing order relative length

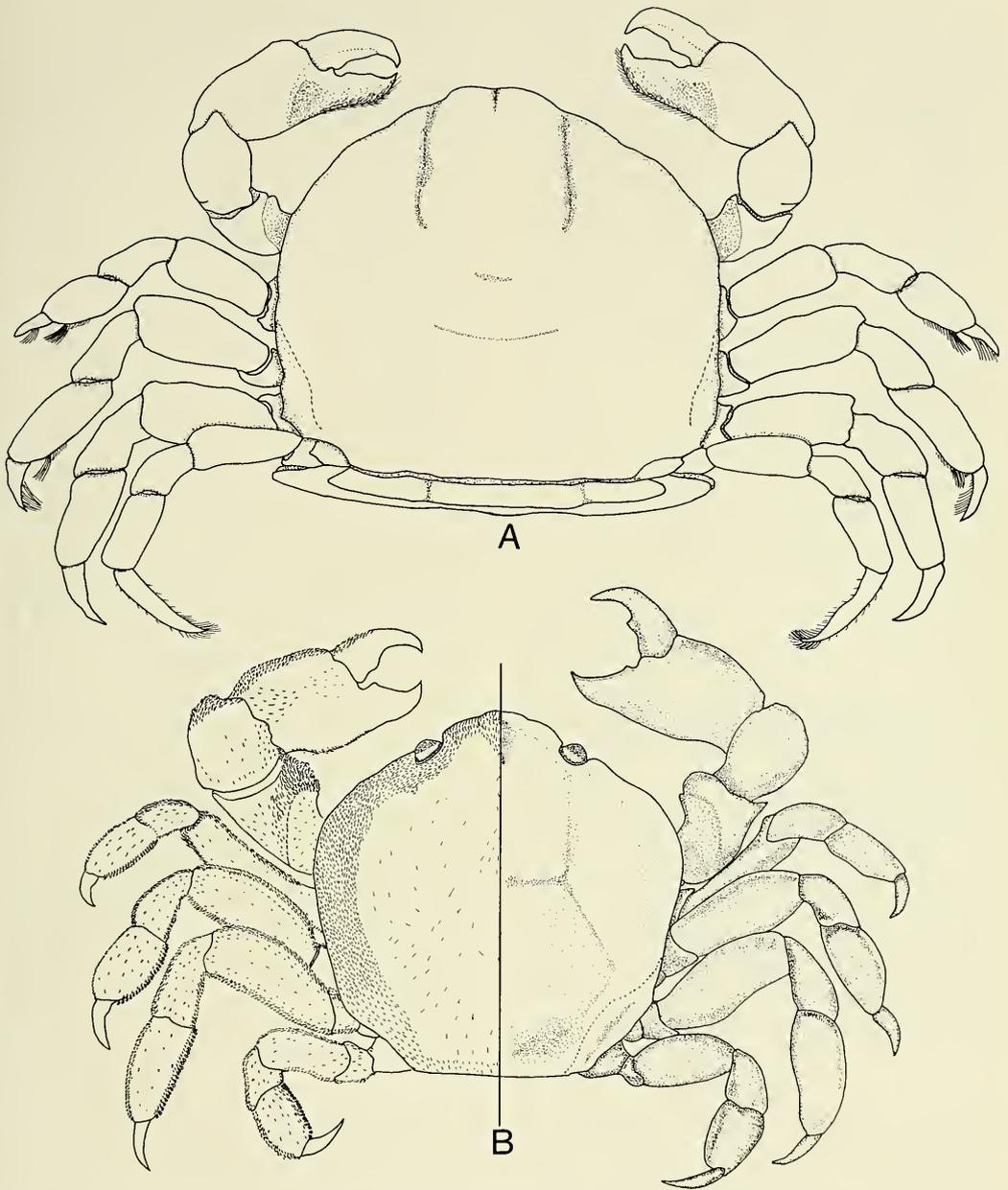


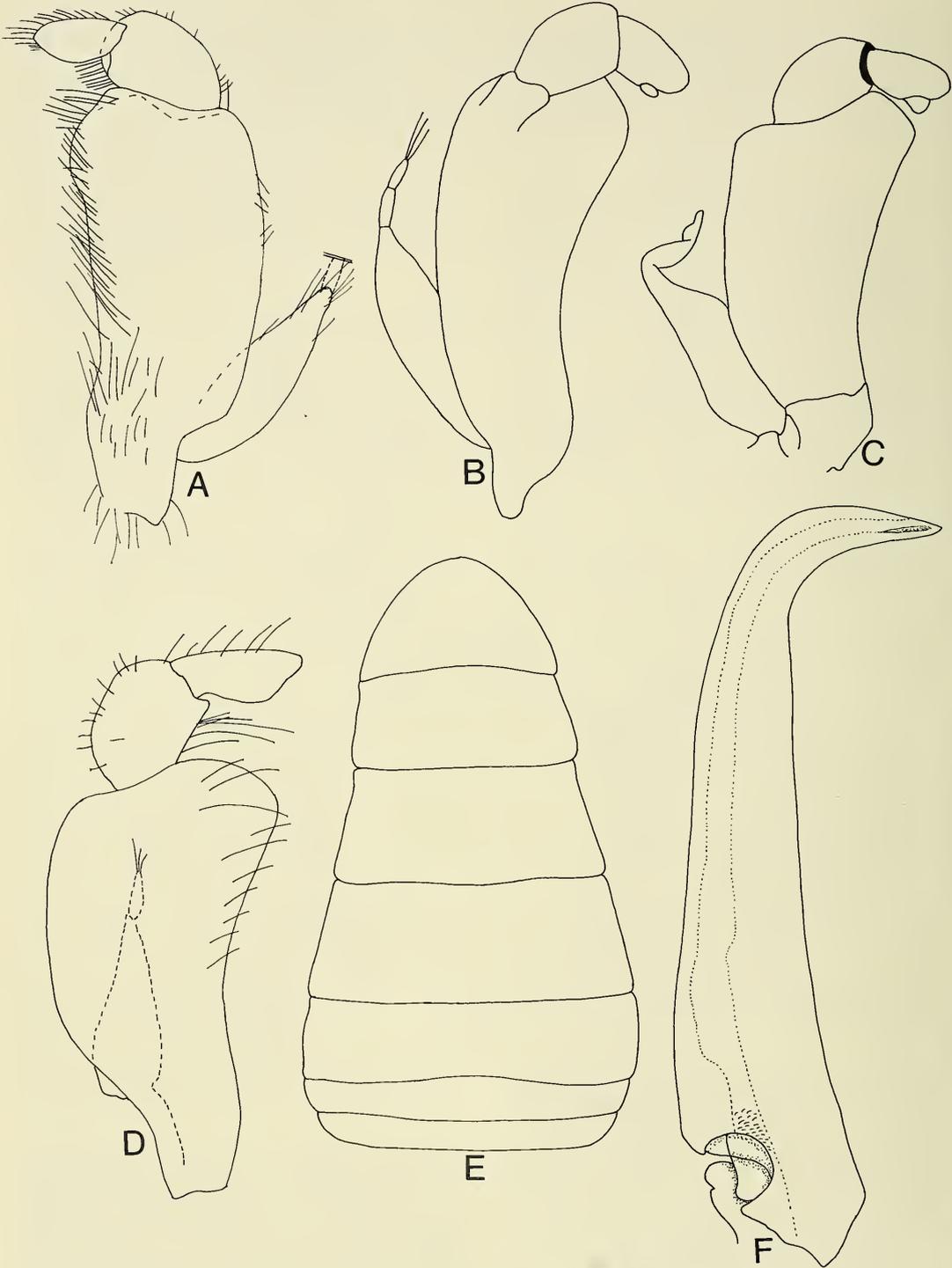
Fig. 1. *Calyptraeotheres granti* (Glassell, 1933): A, female; B, male, right side without hair-like setae.

of walking legs $2 > 3 > 4 > 1$; fourth leg reaching to proximal third of propodus of leg 3.

Abdomen (Fig. 2E) with tomentum on margin, widest at third somite, narrowing

towards triangular seventh somite; fourth somite longest. Gonopods (Fig. 2F) distolaterally acute, curved the tip, forming right angle.

Taxonomic remarks.—*Calyptraeotheres*



granti was incorrectly assigned to the genus *Fabia*. This species has two longitudinal depressions on the carapace arising behind the orbital margin. These differ from the longitudinal sulci of *Fabia*, which invariably arise from the upper margin of the orbit (see fig. 54a in Rathbun 1918). In *C. granti* the palp of the outer maxilliped is composed of two articles, the carpus being longer and wider than the digitiform propodus. In all species of *Fabia* the palp of the outer maxilliped has three articles, the carpus being shorter or subequal than the trapezoidal propodus and the dactylus inserted invariably in the middle of the ventral margin of the propodus. In addition, the abdomen of the male in *C. granti* has seven free somites. In contrast males of *Fabia* sensu stricto have two or more abdominal somites fused. As regards to the male's abdominal morphology in the genus *Fabia*, Gore (1986) pointed out that *F. subquadrata* and *F. concharum* have seven free abdominal somites. This supposition herein is considered as a misinterpretation of Davidson's (1968) figures. Rathbun (1918:86) describing the male and the hard stage female of *F. subquadrata* [as *Pinnotheres choncharum* (Rathbun), see Wells (1928) and Davidson (1968) for corrections] noted that the abdomen of both adult males and immature females possesses the fourth and fifth somites partially fused, contradicting Gore's (1986) interpretation. With respect to *F. concharum*, examination of two hard stage females from the Allan Hancock Foundation (males were not found in the United States National Museum or elsewhere) revealed that abdominal somites 2–4 are fused. Previous accounts about the morphology of the stages of development in Pinnotheridae (Christensen & Mc-

Dermott 1958, Pearce 1966, Jones 1977, Campos 1989b) have pointed out that an adult or hard stage male and an immature or hard stage female are almost identical morphologically; this applies to the male and immature female of *Fabia subquadrata* (Rathbun, 1918:86). These observations permit me to infer that males of *F. concharum* have, like the hard stage female, the abdominal somites 2–4 fused. This inference, which must be confirmed, in my opinion is more believable than the interpretation made by Gore (1986). His are based neither on specimens nor in descriptions of the above-mentioned species of *Fabia* but on the Davidson's (1968) figures, which do not reflect adequately the morphology of the male abdomen in both *F. subquadrata* and *F. concharum*. Additional data that support my above-mentioned inference about the abdominal fusion in *F. concharum* is that males of *F. emiliai* (De Melo, 1971) (perhaps a junior synonym of *F. byssomiae* Say, 1818), *F. tellinae* Cobb, 1973 and a new species of *Fabia* from the Golfo de California have two or more abdominal somites fused. This is similar to the condition observed in males and females in the hard stage of *F. subquadrata* and females in the hard stage of *F. concharum*. The remaining four species of the genus *Fabia*, *F. canfieldi* Rathbun, 1918, *F. sebastianensis* Rodrigues da Costa, 1970, *F. obtusidentata* Dai, 1980, and *F. delderi* Gore, 1986 are incorrectly or questionably assigned to *Fabia* (Campos, in prep).

Ecological remarks.—*C. granti* is common on the intertidal area of the peninsular coast of the upper Golfo de California. However, the greatest number was found in Laguna Percebú area. There I have recorded

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 Fig. 2. A, D–F: *Calyptraeothers granti* (Glassell, 1933). B: *Pinnotheres garthi* Fennuci, 1975, third maxilliped of male. C: *P. politus* (Smith, 1870), third maxilliped of male. A, third maxilliped of female; D, third maxilliped of male; E, Abdomen of male; F, first pleopod of male. A, slightly modified from Glassell (1933); B, redrawing from Fennuci (1975); C, redrawing from Garth (1957).

infestation up to 35%. According to Glassell (1935), *C. granti* was found as symbiont of *Crucibulum spinosum* (Sowerby, 1824), *Crepidula nieva* C. B. Adams, 1852 (= *C. striolata* Menke, 1851), and *Acmaea mesoleuca* Menke, 1851 [= *Nomaeopelta mesoleuca* (Menke, 1851)]. Although I have collected the above three species of limpets, I found *C. granti* living in *C. spinosum* only, a species that I consider as the preferred host. My conclusion is based on the fact that *C. spinosum* is the only of the above species of limpets that possesses a suitable space between the cephalic area and the shell for the growth and development of *C. granti*. The other two species, which have the cephalic-shell area very reduced, perhaps may harbor occasionally and temporarily very young stages of the crabs. This agrees with the observations recorded by Glassell (1935).

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